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The Proper Work of Experiment Stations.

IT is only twenty years since the establishment of our first state agricultural experiment station, and now there are more than fifty of them, manned by nearly six hundred persons, and costing a million dollars a year. This implies a substantial taxation of the whole people in the interest of the farmer, but it is only one part of a system which has been organized for his instruction. Besides the various land-grant colleges, the shorter agricultural courses in most of them, the farmers' institutes and migratory dairy schools, there are boards of agriculture with paid secretaries, and exhibitions of crude and manufactured products, all of which, together with the agricultural and scientific press, are endeavoring in one way or another to instruct the farmer in scientific truth, or in manual practice.

The resultant of all these educational forces will, of course, be most beneficent when they are properly correlated—that is, when all together provide the most comprehensive instruction, and when each is doing what it is best fitted to accomplish. Now, what shall be the specific place of the experiment station in this scheme? Very plainly, the basis of the whole structure should be accurate scientific knowledge. There is abundant room for the so-called practical man to report the results of his work. But, after all, the one thing most difficult to discover, and the one thing most useful to know, is the laws and facts—that is, the pure science—which is to be found at the root of all successful practice. The stations are supposed to be officered by men who have the training and temper which fit them to do this work. They constitute a body of skilled investigators who have opportunities and equipment for this work which no one else possesses to such a degree. It would seem clear, then, that the more closely the stations adhere to the primary purpose for which they were created the more thoroughly they will do their part in this complex system.

We have lately read two papers which, from different standpoints, give support to this view. One of these, entitled "Permanent Elements in Experiment Station Work," was read by Dr. A. C. True, before the Association of Agricultural Colleges and Experiment Stations; and the other, entitled "Conservatism in Scientific Agriculture," by Dr. W. H. Jordan, at Trenton, New Jersey. Dr. True's paper is primarily a protest against the shifty methods of appointment and administration as now practiced, and a plea for a permanent tenure of office among the station workers, without which there can be no unity and continuity of purpose, and no esprit de corps, to insure loyalty and enthusiasm. Dr. True added, and he might have added with greater emphasis, that a permanent staff, or at least a well defined and persistent administrative purpose, is needed because the most important investigations of the station are those which must be carried on over long periods of time. Of course, all this work must be executed with faithfulness and the results recorded with accuracy, but the final answer to the tests which are made may not be given for years; and it is this patient waiting, this refusal to adopt what is partial and temporary as finally and entirely true, which gives experimental work its genuine value. The individual farmer cannot prosecute investigations of this sort; neither can societies which are made up of practical farmers and gardeners. They can only be conducted by persons who are devoted to this line of work exclusively. And this means that the best and most effective work of the stations will be the study of principles which may take years to establish.

Dr. Jordan goes a step farther. He admits that it is a true function of a station to show in what way existing knowledge may be utilized by experiments which serve as object-lessons. He might have added that wherever principles are known and established it is the proper function of the station to publish them as widely and reiterate them in as many ways as possible, so long as real knowledge is disseminated. But he states truly that some of the conclusions published by the stations on the basis of hasty tests will find no place in the permanent records of scientific progress except as warnings. The people who pay for this work are impatient to see something for their money, and they drive the stations to field trials of fertilizers, to experiments in feeding animals, conducted so loosely and hastily that no safe conclusions are possible. This means that there should be less haste in promulgating conclusions which have not been reached by a rigid inquiry. It means that the stations shall not be nervously anxious to show some immediate and apparently practical results when they ought to be making more severe scientific investigation. Such inefficient station work is negatively bad, because it is done at the sacrifice of time and opportunity which are needed to search out the fundamental truths of pure science, and it is positively bad, because wrong teachings mean delay and disaster in agricultural practice. The people are blameworthy for much of the crude station work, because they are impatient while their teachers are making what seems to be slow progress in solving nature's problems. It is true, as Dr. Jordan states, that the work which lives longest and exerts the greatest influence upon the art of agriculture is of that purely scientific kind that is carried on with infinite pains in the laboratory by men who do not themselves appreciate what will be the far-reaching influence of their labor.

The stations in this country have already done an inestimable amount of good for agriculture in helping the farmer to repel the attacks of insects and of diseases which injure his crops, in improving the quality of his fertilizers and foods, and in many other directions, and when we remember how few men there are in the country who are competent to make experiments and deduce from them scientific principles, it is more than surprising that they have accomplished as much good as they have. Every year, however, it should be less difficult to secure an efficient staff, and every year there is less excuse for wasting time with inconsequential plat trials with fertilizers, or comparative tests with peas and strawberries. That the stations have done as well as they have is due to the fact that they have so generally adhered to the strict line of scientific work. The more closely they confine themselves to work of this sort, the more certainly the results they achieve will educate the farmers of the country up to the belief

that their hope is not in luck or in guesswork but in exact knowledge, and they will then turn naturally for help to these institutions instead of trusting to tradition or being influenced by prejudice or superstition.

The article of Mr. R. Clifton Sturgis, in the June number of *The Cosmopolitan*, which has been mentioned several times in these columns, contains an interesting paragraph on the formal planting of home-grounds. When quite small places are in question, Mr. Sturgis is certainly right in pleading for a considerable measure of formality in their disposition. He says:

I know that there is a prevalent dislike to formality in gardening, and many good authorities point out, with some seeming show of reason, that we can never hope to attain more beautiful results than does Mother Nature herself, and that the nearer we approach her wild luxuriance the more beautiful our work will be. Now, while this may be true of the forest, the mountains and the great stretches of sea-coast dunes or inland prairies, it is not true if applied to the treatment of a comparatively small and necessarily formal piece of ground. I say necessarily formal, for the moment we put a house on the ground and arrange approaches we have made it formal, and if under these limitations we attempt, as is sometimes done, to avoid this formality, and seek to hide our approaches and make our house seem part of the rock on which it stands and as irregular in its plan and outlines as the rock, we get a forced effect which may possibly be picturesque, but which is not restful in any way and which has not the elements of a permanent home. If our piece of land is necessarily formalized when we place our house upon it, it is better in every way that the surroundings should show the restraining influence of man's hand and bear the impress of his thought; and, moreover, the grounds should show that they have been considered in connection with the house. Order is the real keynote of the small house and the small place. To accomplish this the house and the place must be studied together, and the owner or the architect should know something of the outdoor as well as the indoor needs, so as to give each its due consideration. . . . To this end formality of treatment is necessary, and if necessary we may be pretty sure that it may be and ought to be beautiful, as the fulfillment of need is true beauty.

Waste Planting in Illinois.

ALMOST all the groves planted in the prairie states have had for their object the protection of homesteads, and have, therefore, been placed without regard to the character of the soil in which they stand. They usually occupy rich fertile soil, and in this respect, as in others, they are not exponents of the best forestry practice, which would confine them to lands of least value for tillage. At Ridott, Illinois, Mr. Thomas Hunt has made a plantation of about ten acres of ridge land, a poor clayish soil from one to two feet deep, underlaid with laminated limestone, which is much broken by cross fractures. Mr. Hunt attempted to cultivate this land for a number of years, but finding it too poor for farm crops he planted trees upon it in 1873.

In one part of the grove European Larch was set in a mixture of hardwoods, including White Elm, Green Ash, Black Walnut, Box Elder and other species. In the remainder, rows of White and Scotch Pines, Norway Spruce, Arborvitæ and Larch were alternated with rows of Willow, Elm, Ash, Poplar, etc. In the winter of 1895 more than half the Larch were cut from the deciduous part of the grove, and averaged two good fence-posts a tree. The remaining stand of trees is only fair, and a considerable growth of weeds and grasses among them indicates the need of a denser leaf canopy. In the other part of the plantation, however, the conifers have almost shaded out the hardwoods, and their dense cover makes weed growth impossible. The Larches are the tallest, with the Pines and Spruces of about equal height, averaging thirty-five feet. White Cedar is somewhat oppressed by the others, but is making fair growth. Seventy White Pines, measured as they come, averaged six inches in diameter, breast-high, last spring. This represents an average width of annual ring of about one-third of an inch; certainly a very satisfactory growth considering the site. Mr. Hunt has not only taken a large number of fence-posts from this otherwise useless land, but he has remaining a thick stand of timber that is constantly increasing in value, and which promises a yield fairly comparable to that of his more fertile acres.

Washington, D C. *Charles A. Keffer.*

A Botanical Journey through New Mexico.—I.

THE last day of July, 1895, found me at Las Cruces, the first station of importance on our way up the Rio Grande from El Paso. Las Cruces is a pleasant little city of four or five thousand inhabitants, of whom more than half are Mexicans. It is the seat of the Agricultural College of New Mexico. The valley of the Rio Grande here is wide and but little above the level of the river, which is treacherous and shifting, and often changes its course, as the old river-beds show. In the vicinity of the city irrigated agriculture is conducted on a more extended scale than it is at any other point in the territory. The conditions of soil and climate are especially adapted to the operations of gardening, and orchards and vineyards abound. Not only are the home wants of the people fully supplied, but also large quantities of vegetables and fruits are exported. Later, and during the early winter, as I went northward, I often saw as fine fruits as any country affords on the fruit-stands of the villages and cities. On asking the sellers whence the fruit came, the replies often were, "from Las Cruces, New Mexico."

Mexicans here do most of the farming. Some of their ways are exactly those of the days of Abraham. Oxen and donkeys tread out the grain, the men and women winnow it by throwing it with flat wooden shovels into the air. So they literally tread the wine-presses with their bare feet, while the purple juice bubbles up between their swarthy toes. They often, too, ferment their wine in leathern bottles. But not only are railways and telegraphs, telephones and electric-cars in New Mexico, but also such other civilizers as the reaper, the threshing-machine and the fanning-mill are already here, and in a few years these primitive methods of farming will only live in the memory of the oldest inhabitant.

A lofty range of mountains, whose numerous jagged points rising above the mountains proper have suggested to the people the name of "Organ Mountains," are in full sight from the city and not far away. Early in my stay Professor E. O. Wooten, of the Agricultural College, invited me to visit these mountains with him. We left the city just as the sun was rising, and a ride of about two hours carried us to the foot-hills of the range. It was an hour or more before we had made our way through a long, deep and wide cañon to the perpendicular wall of rock, a hundred or more feet high, over which poured a miniature stream, forming at its base a pool of bright, pure water, which afforded us drink and kept our melons cool.

Among the many trees growing in the mountains we saw the south-western Locust, Robinia Neo-Mexicana, a handsome small tree, and worthy of general cultivation for the beauty of its red flowers. It protects itself by larger and stouter spines than the eastern Yellow Locust needs, and its abundant fruit is thickly covered with bristly hairs. Rosa Fendleri, growing in a deep ravine near a spring, was near neighbor to the Locust, and a tall Berberis, a stranger, loaded with red fruit. It bears leaves different in form from those of B. trifoliata. I should have called it B. Fendleri, but Professor Coulter tells us that the berries of that species are blue.

In the cañon, up which we came to our camping-place, we found Mullugo Cerviana. It is a long way from Las Cruces to Llano Texas, where I saw it first and last, and exchanged congratulations. So it doubtless may be found at many stations between those places. Here M. Cambessides bears its relative company. This species once formed the genus Glinus. Its degradation, perhaps, was uncalled

for. Now that the change has been made its restoration to generic rank may not be advisable. Both species are so diminutive when growing among other plants that they may easily be overlooked. Later I found larger specimens of M. Cerviana growing commonly on the mesa between the city and "Little Mountain." Two handsome small species of Phlox grow abundantly on the mountain sides, while Janusia and other El Paso plants are not uncommon in the ravines.

I have met few localities where as many interesting and handsome Ferns may be found as these mountains afford. Gymnogramme Ehrenbergiana is not uncommon on shaded moist rocks. In company with it grew Notholæna ferruginea, N. sinuata and the peculiar N. Hookeri. Several species of Pellæa, including P. Wrightiana, abound. This species grows northward to Saline River and "Rock City" in Kansas, and eastward in that state to the bluffs of Marias de Cygne River, in Morris County, its most eastward reported station. We were in the mountains to find these and other Ferns in their best development, and we enlarged and enriched our collections with fine specimens of them.

Ipomœa incana, a widely distributed species in one of its many forms, is here; so are Dalea formosa, Linum rigidum, Erigeron flagellaris, Dryopetalon runcinatum, Aster ericæfolius, Lesquerella purpurea, Solanum tuberosum, var. Krameria parviflora, Oxalis Vespertilionis, Clematis ligustrina, Heuchera rubescens, Perezia nana, Gaura parviflora, which is almost everywhere; G. coccinea, also common; Gossypianthus rigidiflorus, taking its generic name from its cottony flowers; Portulaca lanceolata, P. stellaria and many common and rare plants.

As we rode home a full moon was shining on the banks of the irrigating ditches. The old river bed, the sand hills near the river, the elevated plains and "Little Mountain" each furnished additions to our botanical knowledge and collection of plants. Œnothera Jamesii, a lofty Evening Primrose, is abundant along the ditches. Œ. coronapifolia I saw in the sand hills; it extends far northward. Maurandia Barclayana and Antirrhinum maurandioides are ornamental climbing plants, and are often seen in cultivation; they are very dissimilar in habit, and it is strange that they should be confounded, as they often are.

Near the water several species of Willow grow. The whitened form of Salix fluviatilis is very common, and we shall see it as far north as we go. Along the bank of a ditch a grove of Ash-trees were loaded to bending with immense clusters of nearly ripe fruit, and this was a revelation to me. Lepidium intermedium, Tribulus maximus and rarely T. grandiflorus grow along the railway, while Secuvium, Trianthema, Bigelovia Rusbyi, Helianthus ciliosa, several Chenopods and Amaranths and species of Atriplex are abundant in alkaline soils. Near the river Eclipta alba grows, a queer, rayless and usually spreading composite; near it are Equisetums, a Flaveria and Pluchea borealis. Dalea scoparia, an exclusively western species, begins to appear in western Texas; it is on the sand hills near the river. We shall often see it as we go up the Rio Grande. It is a strong woody species, forming large clumps and often becoming four feet tall. D. lanata is a common western species, delighting to grow on river sand. It has followed the Red River through Texas and the Indian Territory to Arkansas. It is also common in Kansas from Medicine Lodge River, near where it leaves that state, westward to Colorado. Sometimes it spreads into broad patches three to four feet across. D. fruticosa is a very handsome species, to be seen from central Texas to Mexico and westward and northward to Colorado. It becomes a handsome bush or a miniature tree, and is well worthy of cultivation, as most of the species also are.

In the arid regions of central United States numerous species of Artemesia, Wormwood, make their home. They are not anthelmintics, but the officinal Wormwood of Europe and of old gardens in this country was supposed to be a mind strengthener and a curative for so-called mental diseases. All of the species are coarse, rayless, usually shrubby, and sometimes viscid plants. They are generally known as Sage and Sage-brush. That common name, and the general lack of accurate botanical knowledge among the people, has led some persons to use the leaves of various species as seasoning for their sausages. Some of the species, too, are used in domestic practice as a remedy for colds and chills and fevers, and rarely infused as a table drink. In all of those ways the harmlessness, if not the efficacy, of the species is shown. Artemesia filifolia, which is common around the city, without plant egotism, may claim as much beauty as any of the species. A species of grouse, common in all the mountain region, is said to feed so much upon the buds and seeds of those plants as to render its flesh unpalatable from its bitterness. The birds are known as sage hens.

This rainy year has brought out the grasses of New Mexico in great profusion of species as well as of their individuals. The vigor of their growth is as great in proportion as the number of the individuals present. About a half dozen species of Boutelona are here; among them peculiar B. eriopoda. That it may be distinct from all other members of the genus, and always able to know itself, this species has developed a densely woolly band around its culm below each node, an effectual, but an odd, specific character for an uneducated grass to plan and make for itself.

Seiglingia (Triodia) pulchella is very abundant throughout all of this region. This year specimens of it are uncommonly large and fine. The handsomer S. acuminata is more rarely to be seen. This species has a wider range than has before been given to it. During my botanical rambles in Kansas I found it quite abundant over that state west of the ninety-ninth meridian—near Hays, Ellis County, Twin Mounds, Rooks County, in Cheyenne County and in the upper Arkansas valley so common as to give character to the vegetation there. Panicum sanguinale is almost everywhere. Here also are P. lachnanthum, P. obtusum, P. colonum, Buffalo Grass (Bulbilis), Bermuda Grass (Capriola), several species of Chloris, Trichloris, Andropogon and of other genera.

Las Cruces and the Organ Mountains are only a few miles distant from the Mexican border. They are also near the boundary of Texas. Botanizing in the vicinity of this city is, therefore, to become acquainted with the flora of northern Mexico and of extreme western Texas as well as to know the plants of southern New Mexico. Las Cruces is west of the one hundred and sixth meridian and also west of the north-south centre of the territory.

North Platte, Neb. *E. N. Plank.*

Foreign Correspondence

London Letter.

Lycoris squamigera.—Plants of this Japanese Amaryllid are now flowering in the open air at Kew for the first time. They are established in a south border against a tropical fernery, conditions which suit the Belladonna Lily, and which are evidently suitable for the Lycoris. The scapes are from two to three feet high, solid, and bearing from six to eight flowers, which in size, form and general characters are very similar to those of the Belladonna, the most marked difference being in the minute stigma and bluish tinge of the Lycoris. Plants of Amaryllis Belladonna, var. blanda, are also in flower, this variety being about a month earlier than the type. The Lycoris is not a success as a pot-plant, but in a warm sunny border against a south wall it gives no trouble, growing freely, and every bulb pushing up a scape. If it were not for the difference in the seeds between Lycoris and Amaryllis one might doubt the wisdom of keeping the two genera separate. L. squamigera was distributed a few years ago under the name of Amaryllis Hallii (see vol. iii., p. 176, fig. 32, and vol. viii., p. 84).

Ornithogalum revolutum.—This is one of the few species of Ornithogalum which deserve to rank as first-rate garden

bulbs. It belongs to the same section of the genus as O. Arabicum and O. thyrsoides, differing from them in having narrow leaves and slender scapes, while the flowers, though smaller, are at least as attractive in being numerous and prettily marked. The bulbs are about an inch in diameter, the leaves nine inches long and half an inch wide; scapes erect, a foot long each, bearing a subumbellate raceme of about twenty flowers, which are one and a half inch across, star-like, glistening white, the lower half covered with a blotch of deep olive-brown. The species is a native of south Africa, from whence it was introduced and cultivated in England nearly a century ago. It has lately been reintroduced from the Cape to Kew, where some potfuls of it are now flowering in a cool greenhouse.

Gladiolus primulinus.—When Mr. Baker described this species from a newly imported bulb six years ago it was much weaker than it is now. About a dozen spikes of flowers are now at their best in a sunny border, and in length, sturdiness and number of flowers they almost equal Gladiolus dracocephalus or G. Quartinianus; indeed, one might describe G. primulinus as a G. Quartinianus with yellow flowers. The scape is three feet long, and it bears about ten flowers arranged loosely on the upper third. The flowers are remarkable in having the top segment curved downward, completely hiding the inside of the tube and three lower segments, while the pair of upper lateral segments are broad and spread outward wing-like. When they first open the flowers are greenish yellow, afterward becoming primrose-yellow, with a few dust-like spots of red about the base of the segments. It is a promising garden plant.

Crinum Powelli.—Fine masses of the rose, rose-crimson and white-flowered forms of this hybrid Crinum are conspicuously in flower in sunny borders at Kew. A batch of seedlings obtained at Kew by crossing the white C. Moorei with C. longifolium (Capense) is now flowering for the first time, and while they are a shade paler in color than C. Powelli true and the flowers somewhat larger, they are not sufficiently distinct to be worth naming. The practical lesson this batch teaches is that in four years one may obtain a big batch of a beautiful hardy Crinum by crossing the common C. longifolium with the equally common C. Moorei.

Lælia Lucasiana.—This distinct species was introduced three years ago by Messrs. F. Sander & Co., from Brazil, and named by Mr. Rolfe in compliment to Mr. C. J. Lucas, of Horsham, a well-known amateur collector of Orchids. Judging by its behavior so far under cultivation, it does not flower freely. It was exhibited in flower at a recent meeting of the Royal Horticultural Society, and a plant of it is now in flower at Kew, where a figure has been prepared for publication in *The Botanical Magazine*. It is a dwarf species, the fusiform pseudo-bulbs being about three inches long, the leaves, three to four inches, thick and fleshy, as in Lælia Digbyana, and the scape short, erect, two or three flowered, each flower two inches across, the segments equal and spreading, bright purplish-mauve, the lip channeled, recurved, very wavy and colored saffron-yellow, white near the tip. The Kew plant is kept in a moist tropical house while growing, and rested in the Cattleya house. Its nearest ally is L. crispilabia.

Cynorchis grandiflora.—When introduced from Madagascar three years ago it was feared that this terrestrial Orchid would prove difficult to keep. So far, however, it has behaved exceptionally well under the following treatment. After flowering, the plant is placed on a dry shelf in an intermediate temperature and allowed to rest until February. It is then shaken out, the tubers repotted—a mixture of peat and sphagnum—and placed in the tropical house on a shelf near the glass. When new growth pushes through the soil, water is given freely and the plant is kept well supplied until resting time comes round again. Under this treatment the plants have made healthy leaves over a foot long, and in July developed stout scapes as long as the leaves, each bearing one or two flowers one and a half inches across, the large four-lobed moth-like rose-purple lip being their most attractive feature, the sepals and petals being smaller and colored green, with purple spots.

Phajus Humblotii.—Few cultivators can boast of having grown and flowered this plant several years in succession. The best-grown examples I have seen were in the nursery of L'Horticulture Internationale at Brussels, but these were recently imported plants. Mr. White, the clever Orchid grower in charge of Sir Trevor Lawrence's collection, while recording his own failure in the management of this plant, gives the following cultural directions for it which he had from an enthusiastic amateur who is successful in the cultivation of Madagascar Phajuses. I quote them from *The Gardeners' Chronicle*: After trials in various warm and intermediate temperatures, some few plants were placed in a shady position in the cool Odontoglossum house, where, under ordinary treatment as to watering, etc., they quickly regained health, producing good leaves and strong flower-spikes. He now considers it to be one of the easiest of Orchids to manage. The compost recommended for it is fibrous loam, leaf-soil and sphagnum in equal parts, with a liberal sprinkling of small crocks. Water sparingly till vigorous root action is evident, and then increase the supply. This Phajus is in flower now at Kew, but here it is grown in a tropical temperature, and consequently the leaves are much damaged by yellow thrips. The species was introduced about sixteen years ago by the French collector, Humblot, who discovered it in the interior of Madagascar at the same time as he discovered the beautiful P. tuberculosus. Although P. tuberculosus is difficult to manage, yet it has proved a most valuable plant in the breeders' hands, being one of the parents of several of the most beautiful of all Phajuses, hybrid or species.

Hibiscus Archeri.—Four years ago the Rev. S. Archer, of Barbados, sent to Kew a number of seedling Hibiscuses which he had obtained by crossing varieties of the common H. Rosa-sinensis with the Zanzibarian H. schizopetalus. Most of the seedlings were wanting in distinguishing features except one, which proves to be a happy blending of the two parents. It has a loose scrambling habit, leaves intermediate in size, and flowers which in shape, laciniation of petals and long pendent stalks resemble H. schizopetalus. In size, however, they are about four times as large, and in color a rich crimson, equal to the color of the best variety of H. Rosa-sinensis. This beautiful hybrid is named in compliment to its raiser. In one of the houses at Kew there is a large bed filled with a selection of varieties of H. Rosa-sinensis, including double and single flowered, yellow, pink-purple, crimson and scarlet forms. They flower freely, being planted out in a bed of rich soil where they get plenty of sun and air.

London. *W. Watson.*

New or Little-known Plants.

Clematis Addisonii.

THIS rare Clematis, which is closely related to the Leather-flower, Clematis Viorna, was confounded with another species by botanists until a few years ago, when its distinctive characters and history were made known by Professor Britton.* It is a vigorous, glabrous, tufted perennial with stout, erect or spreading purplish stems two or three feet in length. The lower leaves are simple or entire, or rarely two or three lobed, elliptic-oval, sessile and clasping by the broad base, deep blue-green above, glaucous below, from two to four inches in length, and much longer than the upper leaves, which bear stout tendrils on the back or ends of the midribs, and are pinnate, with from two to four ovate sessile leaflets, or rarely entire. The flowers are solitary and are borne on stout peduncles from two and a half to three inches in length and terminal, or terminal on short axillary branches; they are nodding,

* Britton, *Mem. Torrey Bot. Club*, ii., 28, t. 3 (1890).

broadly ovate, conspicuously narrowed below the apex, three-quarters of an inch in length and one-half of an inch in width, with thick leathery sepals, dark violet-purple, plumose dark brown styles from an inch to an inch and a quarter in length.

Clematis Addisonii inhabits the Alleghany Mountains

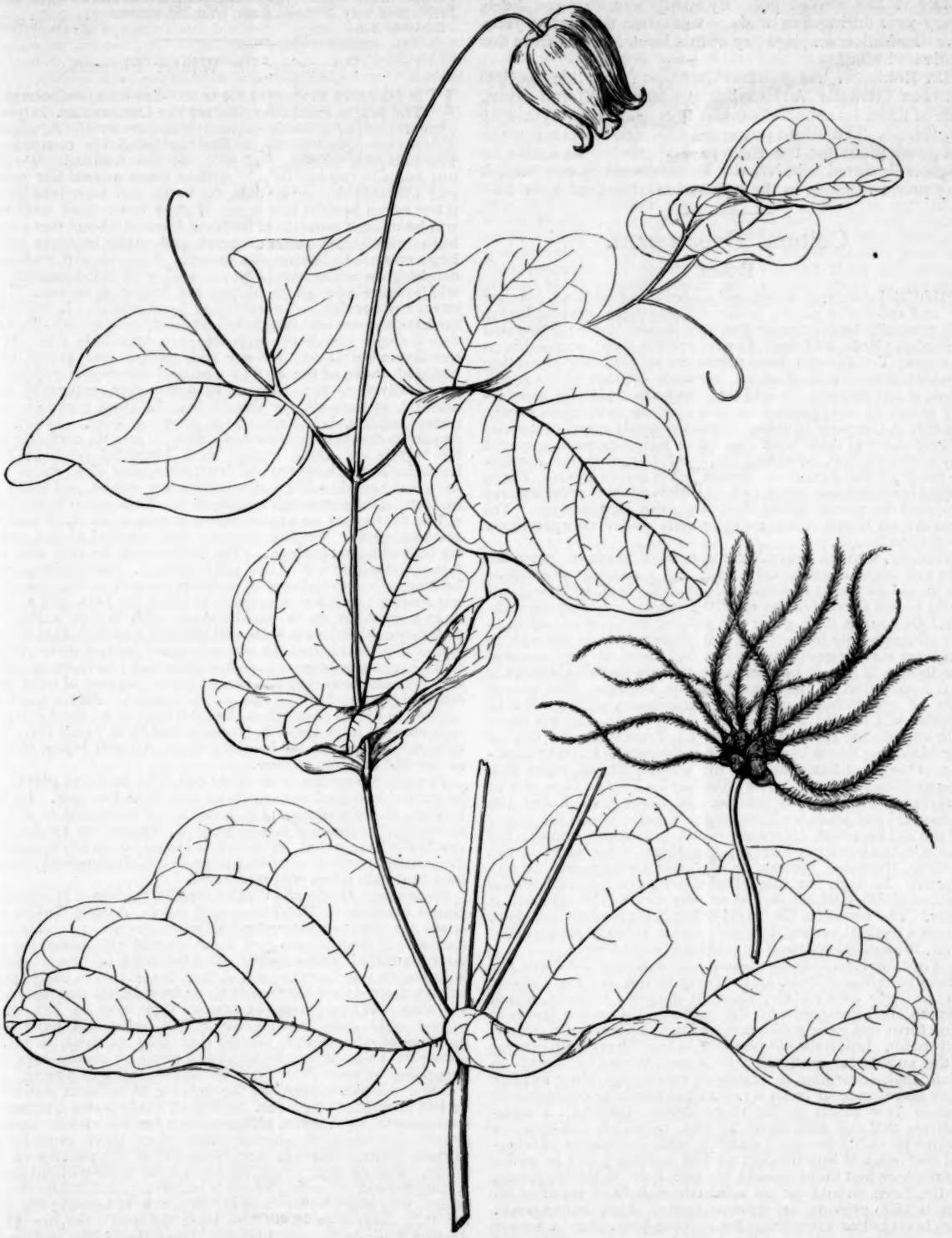

Fig. 43.—Clematis Addisonii.—See page 324.

except at the acute reflexed yellow tips, and numerous stamens about as long as the sepals. The fruits are flat, nearly orbicular, thick-margined and silky pubescent, with from south-eastern Virginia, where it grows on the banks of the Roanoke River, near Roanoke, to Tennessee and Georgia, but does not appear to be anywhere very abun-

dant. Since 1890 it has been growing in Professor Sargent's garden in Brookline, Massachusetts, where it was sent in 1890 by our correspondent, Miss Anna Murray Vail, and where it has proved perfectly hardy and flowered freely every year during five or six weeks after the first of June. The illustration on page 325 of this issue is made from this cultivated plant.

Dr. Robinson has pointed out* that forms intermediate between Clematis Addisonii and Clematis Viorna occur. One of these intermediate forms is considered a hybrid by Dr. Britton. The bright flowers of Clematis Addisonii make it a good plant for the rock or wild garden, and, like its brighter-flowered relative, the Texan Clematis coccinea, it may prove valuable in the production of natural hybrids.

Cultural Department.

Roses.

THOUGH one may grow and experiment with all manner and species of plants, hardy and otherwise, the conclusion will generally be inevitable that the Roses stand preëminent as garden plants, and their flowers are the most acceptable at all times. Yet, though these plants are so generally loved that a garden is poor indeed which does not contain some specimens, it can scarcely be said that they are generally satisfactory plants in the garden of the careless cultivator, except possibly in the early summer, when the hardy varieties usually cultivated are at their best. At other times in such gardens they suffer neglect, crowding and starvation, with the inevitable result of defoliation by innumerable insect pests. Then, having invited these guests, we complain of their presence and condemn the plants rather than our own carelessness. Yet there are no plants more easily grown under comparatively simple conditions.

Probably, if more general attempts were made to grow the Teas and other continuously flowering kinds, more satisfaction would be found in actual results of flowers, and the plants would be apt to receive the required attention during the summer. Of course, during the dry, forcing weather of our ordinary summers the blooms will not mature slowly enough to gain large size or great substance, but even at the warmest time there will always be charming flowers in fair abundance from a collection of the Roses of this section. The choice must be somewhat a matter of experiment, as the different varieties will not do equally well everywhere. In my moderate experience the hybrid Tea, La France, is the first of ever-blooming Roses in abundance of flowers and perfect hardiness. One plant has grown in my garden fifteen years with no protection in winter. The climbing La France is as shy in flowering as the parent is prolific. Of other pink Roses, the Bridesmaid and Madame Testout are satisfactory in the open, and the old Bourbon, Hermosa, is still handsome enough for a place in the garden. For a pillar Rose it far exceeds the Climbing Hermosa, though its summer flowers are not too frequent. In fact, for this climate we have no continuous-flowered climber which is not usually cut to the ground in winter. The beautiful Gloire de Dijon is the nearest approach to such a desired variety, but its laterals seldom survive the winter, though otherwise it is perfectly hardy here.

It is not my intention to make a list of Roses, for there are endless varieties of Teas, and varying tastes, but there is one comparatively new variety, Kaiserin Augusta Victoria, which seems to me a great gain for the garden. This white flower is of fine form and great substance, and the plants are of the most sturdy habit. Lest it should be thought that I have some secret for the successful cultivation of Roses, it may be as well to explain that, according to my best knowledge, they require simply abundance of fresh air, best provided by comparative isolation (few plants suffer more from crowding), a comparatively stiff soil with some humus, of which cow-manure provides probably the most suitable, with abundance of bone-meal well worked into the bed on first making; and to make a satisfactory bed there should be two feet of this compost. Thirdly, there should be an adequate supply of water at all times, both to provide for growth and to deter insect pests. There is no better insecticide for a Rose-bush than a strong stream of water from a garden hose frequently applied. Of course, there are times when Nature brings on her destructive battalions in such force that one is compelled to employ harsher measures, but one year with another I do not find that the insects in my garden get more than their small share of food. It seems much the fashion now to hunt insects with the microscope and many wonderful insecticides, but one can garden more comfortably and quite as satisfactorily in the old-fashioned way without them at most times.

Elizabeth, N. J. *J. N. Gerard.*

* Robinson, *Syn. Fl. N. Am.*, i., pt. i., 5.

Preparing for Winter Flowers.

IT is time now to prepare for winter-flowering bulbous plants. The first to need attention are the Lachenalias. In general appearance these South African bulbs resemble Squills; the flower-stem, particularly, is like that of Scilla campanulata. The foliage is heavier and more or less mottled. We keep our bulbs in the soil in which they were grown last season, and although dry, on a shelf, the bulbs will start into growth if left much beyond this date. If they have done well there will be a large number of bulblets formed about the original bulb, which also remains good, and many of these will be large enough to bloom this season. Such as are undersized can be grown one year in boxes, and with good culture they will be large enough to bloom the following season. There are many species and varieties of Lachenalias. L. tricolor is the handsomest and the kind most commonly grown. Its varieties, Nelsoni and Aurea gigantea, are especially fine. While the flowers of L. tricolor are red, yellow and green, nicely blended, those of the last two named are nearly yellow, and practically so at the distance of a few feet, especially when massed, as they always should be. L. lutea gigantea, as its name implies, is a very strong-growing kind. When well grown its flower-stems exceed a foot in length, clothed nearly the whole of their length with beautiful pendent bells. Lachenalias are easily raised from seed, and if sown as soon as ripe the seeds will germinate in a few weeks, and bulbs will be formed large enough to bloom in a little more than a year.

The bulbs may be grown either in pots or pans, as convenience suggests. We find they do well planted at the rate of six bulbs to a six-inch pot. The soil should be rich and contain a fair admixture of leaf-soil and sand. The drainage must be free, as an abundance of water is needed during the growing season. It is not necessary to bring the pots into a cellar or to bury them, as is usually done with Dutch bulbs. An ordinary cold-frame will do well enough, and if shaded to some extent it will do better. In well-protected frames these African bulbs may be kept growing all winter, and I have known these and Freesias pass through two or three degrees of frost without injury when leafage was well advanced. As we need our plants for winter decoration they are kept in a genial temperature so as to have them in bloom about New Year's Day. This cultural treatment may be given to all African bulbs, or such as we find in gardens here.

Few people realize how many beautiful bulbous plants can be grown in the winter-time with very little fire-heat. In fact, forcing, as we understand it, is not at all congenial to a large number of bulbous plants so grown. Except the tender African bulbs here noted, all so-called Dutch bulbs are brought to the greatest perfection when grown in cold-frames and brought into heat only when well advanced.

Snowdrops, Dog-tooth Violets, Squills, species of Hyacinthus, Grape Hyacinths, Fritillarias and many Asiatic Tulips and Irises are never so interesting as when grown in pans in cold-frames. A large number of them are not well suited for out-door planting in this country. The breaking up of our winters is too severe and prolonged. A fine day or two in early spring brings them into bloom only to be frost-bitten and miserably set back. When grown in frames they may be left undisturbed until early in February. The bulbs will have been growing all the winter, though but little of them is visible above the soil. When watered and aired on sunny days it is surprising how soon they will come into leaf and flower.

It is a mistake to suppose the moving of bulbous plants can be left until frosty weather. Nearly all hardy bulbs commence root-growth in August. There may be no visible upward growth, but when root-action takes place there must be important natural changes occurring within the sheaths of the bulbs. Potting and replanting should be done without delay. A long season of undergrowth is necessary, and, no doubt, the reason why store bulbs so often do poorly is because the time for this natural function has been delayed. On the 3d of August I moved some bulbs of Grape Hyacinths and found them started. Snowdrops, Chionodoxas and Squills were still dormant. To digress a little, these bulbs were raised from seed sown two years ago. They are all large enough to handle, and some will bloom next spring. The intention is to plant them in grass on a protected slope which is quite sunny

until some scattered Oaks come into leaf. The bulbs, however, will have flowered and commenced going to rest before the Oaks are in full leaf.

Tender plants for greenhouse decoration during winter are making good growth. Stevias and Bouvardias are kept pinched in order to have them bushy. Superfluous eyes and root growths are cut away from tender Hydrangeas, and only such growth left as will be required to bloom next winter and spring. Some will be grown to four shoots and some only one. The heads produced in this way are immense, and if the plants are properly regulated with regard to height they will be fairly uniform. To have well-flowered plants next spring requires attention now, and the growth must be restricted, so that the wood which is made will properly ripen; in this way very little pruning will be necessary next spring.

Wellesley, Mass. *T. D. Hatfield.*

Achimenes.

IN this neighborhood most of the varieties of Achimenes are useful summer plants, both for greenhouse decoration and for rock-work. It is somewhat strange to see Achimenes growing in company with Silenes, Dianthus and the like, but the list of hardy herbaceous and alpine plants suited for rock-work, and which survive our hot summers, is so small that we are driven to the necessity of utilizing plants from warmer countries. By the beginning of August the majority of hardy plants are out of bloom, and the Achimenes serve to brighten things up considerably. For use in the rockery the tubers are started as late as possible, say, about the beginning of May. We use five-inch pots, filling them with a compost consisting of leaf-soil, sand and old manure which has been passed through a half-inch sieve, to within an inch and a half of the rims. About ten of the tubers are placed at equal distances from each other over the surface, which is finished off with about three-quarters of an inch of finely sifted soil. Placed near the light they will in a few weeks be ready to take the places of plants in the rockery which are past for the season, such as Pansies, native Violas, at least those kinds which reproduce themselves freely from seed, the annual Silenes, Delphiniums, Dianthus and a host of others. I find it the best plan to plunge the pots, instead of planting them out, as in this way the tubers are easily lifted in the fall. All that is necessary is to lift the pots and store them in a warm dry place under the greenhouse bench. While they are out-of-doors they should, of course, never be allowed to suffer for want of water during dry spells. The tubers which are formed out-of-doors are much superior to those formed in the greenhouse, and it is advisable to use those grown outdoors for greenhouse work the following season, saving the previous season's greenhouse tubers for the rockery. By this method they increase very fast. In starting the plants for the greenhouse all that is needed is to cut away the old stems from the plants in the five-inch pots, scrape away a little of the surface soil, give them a thorough drenching and afterward a top-dressing of sandy soil, water with a fine rose and put them near the light in a warm house. As the plants need more pot room they should be potted in eight-inch seed-pans as the final shift, using the same mixture as already stated, with abundance of drainage. If the shoots grow too close together a few twigs placed among them, bending the outer ones toward the sides, will be found to answer well. A great deal of time may be spent in tying each shoot to small sticks; this is necessary if very symmetrical specimens are desired, but they look much more graceful when allowed to grow in a natural way. Those intended for indoor use can be started so as to have them in bloom almost at any season of the year. A great many varieties are in cultivation; the colors of the flowers are principally rose, white, orange, purple, crimson and scarlet. Those varieties with rose and purple flowers are the strongest-growing.

Botanic Garden, Washington, D. C. *G. W. Oliver.*

Some Novelties.—I.

NOT the least interesting portion of the year's work in the garden is the testing of the novelties offered by the dealers. Every season most of them have to be taken on trust from the great European growers, from whence many are derived, and others are of American origin, and it is satisfactory to note the increasing value of the latter over those of foreign origin, and as well as their better adaptation to our needs and that of the climate. It may be worth while to speak of some annual and perennial plants which have been tried here from various sources.

The Imperial Japanese Morning Glories are among the more remarkable novelties of last year, and it is surprising that they have not been introduced from Japan before; there is wonderful variety among them, quite as much as promised, the foliage of many being beautifully mottled with white, and these when separated at planting-time and placed together make a very beautiful effect, not unlike the variegated Hop that came out with such a flourish a year or two ago and proved to be such a weed. I have heard complaints as to the germinating qualities of the seeds of these Ipomœas, and also that they did not grow so freely as might be desired; we found no trouble in getting the seeds to grow after carefully drawing a sharp knife round each and soaking them in water for a few hours, and planting a few at a time as fast as they became distended with moisture; if they did not swell we used the knife again, and the young plants were above the soil in a very few hours after planting. We did find that the plants grew slowly in pots, and no progress was made until they were set out in warm weather, and I fancy it would save time and trouble another year to keep the seeds until the end of May, soak and sow out-of-doors where they are to remain. We have set them round bean poles in the border, and these are already clothed to the top and flowers are coming rapidly of exquisite colors, some having the appearance of being double, owing to the way they are ruffled.

Madame Gunther's Hybrid Nasturtiums are being treated similarly as to poles, and it is surprising how beautiful an object is a group of climbing Nasturtiums when they have a chance to climb. The flowers are shown off to the best advantage, the plants do not overrun other things in the border, and as this strain is really a fine one, the effect is pleasing and promises to last until severe frosts put an end to this display.

The Sweet Pea Cupid, to say the least, has enjoyed a good entrance into garden life, and is also all that has been claimed in advance, but I fail to see in it any practical value as compared with others that are tall. Its stems are so short as to be of no value when cut, and there are many better plants of dwarf habit that seem to be more useful than Cupid, even if one could get the seeds to grow freely. There seems to be either a constitutional weakness about white-flowered Pea seeds, or something more difficult to explain. Seeds of Emily Henderson germinated very poorly under exactly the same conditions as the others that came as well as could be desired. Possibly when the stock grown is larger we shall get more of them to grow. It is singular that this same dwarf Pea should have occurred also in two different parts of Europe as well as in California. Blanche Ferry is a kind much in favor, and we have for years saved our own seeds of it; we think ours must be specially good, for they came into flower sooner and are really better than the Blanche Ferry Improved, tried this year for the first time. Katherine Tracy, we believe of the same origin as the last, is altogether one of the best. It must be a selection from Blanche Ferry, for we have seen it so grown by a florist in this state who found the beautiful shade of clear pink the same color as the Daybreak Carnation, very much appreciated in the Boston market, and he grew a quantity of it last winter in the greenhouse, but he had not quite got it fixed, and there was still a tendency to sport, none of which is apparent in Katherine Tracy as we have it now. The season has been very favorable for Sweet Peas; no watering was necessary, owing to the frequent showers, and they are better than we remember to have seen them.

We shall soon have as many varieties of Zinnia as of Asters; each year adds to the number, and all have merit, for, considering their utility and easy culture, there is nothing to equal them; there are tall ones and dwarf, and now we have the Lilliput to use as a front row of all, and of the three I rather think that the little ones will be most liked for cutting when better known. There is a refinement and finish about these little gems that all others lack, and the colors, too, are good and well defined. In a long border devoted to annuals the three kinds of Zinnia are a distinct success. Hitherto it has been difficult to get an annual that would tone down from the dwarf Zinnia to the plants used for a margin.

Campanula Japonica was a surprise when seen in the seed-lists. We had no knowledge of Japanese Campanulas, and our knowledge has not been increased in this direction, for we were led to expect great things of a perennial Campanula that flowered the first year from seed, the flowers being of an intense glossy blue, semidouble, and produced in great profusion. All of this has proved true except the name, which should have been Platycodon Mariesii, and we should then not have purchased the seeds.

Another name, Coreopsis Japonica, had a rather interesting look in the seed-list. I had an idea that this genus was a purely North American one, and no authority that we have

access to tells to the contrary, but here was a new bushy variety with large canary-yellow flowers produced from June till frost. If we except the name, all of the rest promises to come true, but I doubt if it is a Coreopsis. It has much greater affinity with the Heleniums, so far as I can gather from Gray's scholarly work on the North American Compositæ.—[See page 316 of our last number.—Ed.]

South Lancaster, Mass. *E. O. Orpet.*

Correspondence.

An Interesting Sport.

To the Editor of Garden and Forest:

Sir,—While passing through one of our principal Rose nurseries lately I saw in a row of the Augustine Guinoisseau (white La France) variety where a shoot the size of one's finger had sprung up this season to the height of nearly three feet, and there parted into four or five umbel-like branches. On one of these was a well-developed flower of the true type and on another an equally well-developed flower of La France. I have seen a good many sports, but I believe none so well defined as this in its primal condition. This, perhaps, may be accounted for in the fact that Augustine Guinoisseau is itself a sport from La France, and here it is sporting back to the original sort. An effort will be made to propagate from both the shoot and the stem on which the sport appeared, and the result will be watched with much interest. Possibly we may sometime know the reason for the production of these sports, but it is certain we do not now. In the mean time we can be thankful that Nature by this peculiar diversion has given us some of her choicest benefactions.

Fruitvale, Calif. *H. G. Pratt.*

From the Missouri Botanic Garden.

To the Editor of Garden and Forest:

Sir,—The loss at the garden from the cyclone was not as serious as its friends feared, and since the removal of the wreck one unfamiliar with the grounds might not note the vacancies. The pile of cord-wood down beyond the arboretum is eloquent, however, to those who know its history; for, after burning the roots and waste branches, there remains about 100 cords of fire-wood, representing 450 trees of large or fair size that were either uprooted, broken off, or so badly mutilated as to be useless. Trees of tender or light root-growth were torn from the ground, but by far the greater part were snapped off at from five to six feet above the ground. A few were broken off higher up, as, for instance, a splendid White Pine at least sixty feet high (the best in the grounds) that stood in the enclosure surrounding the old Shaw residence. It was snapped off at about ten feet from the ground.

The trunks were not twisted, and it is believed that the damage done at this point was not due to the rotary motion of the storm, but to the fierce gale that accompanied and followed it. The moving storm-cloud seems to have come closer to earth farther along on its course to the north-east, its main fury being apparently reserved for the high ground around Lafayette Park. The chief loss at the garden is among trees. Catalpa and Osage Orange trees were practically exterminated. The loss of the Catalpas is keenly felt by the garden authorities, as there were some remarkably fine and large specimens among them, several with trunks more than two feet in diameter. Other trees whose loss is greatly deplored are two or three of the best and largest specimens of Tilia heterophylla in cultivation; two of the best-grown and largest-known specimens of Rhamnus catharticus, symmetrical round-topped trees, from fifteen to twenty feet high, and with trunks eight to ten inches in diameter. These were said by Mr. Nicholson, of Kew, when he visited the garden a few years ago, to be the largest he had ever seen. A Kentucky Coffee-tree, while not so large (forty feet high), was particularly shapely and well grown, and is greatly missed. Other noteworthy losses are a picturesque English Hawthorn, about fifteen feet in height, that was a noticeable feature of the Shaw dwelling-house grounds; a fine Corsican Pine that stood near the main entrance to the garden; the largest specimens of Magnolia Fraseri and Copper Beech on the grounds; and a number of Tulip-trees, including a good one near the house and one in the arboretum that Professor Trelease especially regrets as being a tree that Mr. Shaw took pride in and pointed out to the Professor as the tallest tree in the grounds when he assumed the directorship of the garden some twelve years ago. The tree was then 100 feet high.

Neither time nor money can replace such features, but the loss that can be represented by figures reaches four thousand dollars. This only covers the expense of removing débris and repairing walks, fences and buildings. The damage to buildings comprises the loss of the skylight of the Linnæan house, the roof of one wing of the Gate house, part of the roof of the herbarium and the demolition of an old stable. Iron and other fences were injured in various parts of the grounds, some shrubs were ruined, and walks and beds were wrecked, but the feeling is that things might have been much worse. This feeling is strengthened by the fact that a part of the unimproved ground is shortly to be reclaimed.

Before the storm Messrs. Olmsted, Olmsted & Elliott had been engaged to design the landscape work in the new part, and in addition to plan for changes to be gradually made in the old grounds, to bring them into harmony with the new. The thinning out done by the tornado, or in consequence of its mutilation, will result in greatly simplifying and hastening the alterations in the old grounds, and increases the opportunities for bringing them rapidly into relation with the landscape effects of the newly improved section.

Brighton, Ill. *Fanny Copley Seavey.*

The Water-garden at Willow Grove.

To the Editor of Garden and Forest:

Sir,—No pleasure-ground is considered at the present time complete without a water-garden, and the new park at Willow Grove, fifteen miles from Philadelphia, on the Old York Road, has this year included one in its attractions. The sheet of water planted has pleasing shore lines, and it is spanned by a graceful bridge at its narrowest part, the bridge being built of red stone and covered by the Japanese Ampelopsis. The piece of ground lying between the two main divisions of water is planted with hardy Grasses, Bamboos and other subtropical plants, including a large specimen of Livistonia. Near the shores are some effective flower-beds, although the scarlet blaze of a great mass of Geraniums at one point is too near the soft colors of the Water-lilies, which are now in bloom. The water-garden is some five hundred feet long and averages fifty feet wide, and here are planted, in groups, a large variety of the hardy and tender Nymphæas and Nelumbiums. The hardy sorts were set out the last of April, and a number of flowers opened in June. On the 28th of June the first flower of Egyptian Lotus appeared, and early in July there was a profusion of these flowers and the plants were making luxuriant growth. The tender Nymphæas were planted the latter part of May and some produced flowers the first week in July. Until last October the site of the park was a farm in a high state of cultivation, the natural soil being loam, with a tenacious clayey subsoil. In the construction of this section of the park much grading was necessary. The top spit was valuable and was utilized, after the grading was completed, as a top soil for planting shrubbery, bedding-plants, etc. It also afforded excellent soil for planting the aquatics. The soil in the water-garden was excavated to the depth of three feet; afterward from fifteen to eighteen inches of the top soil was placed in the bottom. The outline of the pond is laid in masonry and is kept below the ground-level, which slopes gently to the edge, and the sod covers the masonry. Besides this pond there is also a Victoria pond, fifty by sixty feet, which is heated by steam from the adjacent power-house.

The Egyptian Lotus is succeeding well. It bears transplanting under proper conditions, but must not be set out too early. Natural conditions and suitable locality should be provided, and the tubers should show signs of starting. Among the early-flowering Nymphæas those of the Odorata type are noticeable. A clump of variety Rosea fifty feet across is a charming sight, as is also a mass of Sulphurea, the exquisite yellow flowers lifted above the water on erect stalks. The southern variety, Gigantea, is superb. If this is started in pots the flowers, as well as the leaves, will be larger and stronger when the plants are established. All the hybrids of the European species, N. alba, are strong robust growers and free and continuous in flowering until frost, and they are doing well here. N. alba candidissima and N. albida are among the best white flowers; N. carnea is a soft pink; Marliac's Rosea is the choice of the hardy red ones, and N. chromatella is well known as a rich yellow. These are all well represented, as are also a number of the tender Nymphæas, embracing all the colors from pure white, pink, red, crimson, blue, purple and yellow.

Altogether this new garden well shows the advance in cultivating aquatic plants. Fortunately, those who desire to visit it will find themselves traversing the most interesting trolley-road that leads out of Philadelphia, winding through delightful scenery, by rich fields, luxuriant pastures and wooded hills.

The rural beauty of the undulating verdurous landscape is undisturbed by suburban "improvements" of any kind, and many of the dwellings are the solidly built, picturesque stone farm-houses of a century ago, now the homes of wealthy citizens. Perhaps, nowhere near a large city in the east can a more satisfying trolley ride be enjoyed. The park itself is planted with taste. The wide walks and avenues follow graceful lines, and groups of flowering shrubs and trees and well-kept turf are established. An avenue of Pin Oak-trees will in time make a striking feature, and stretching away on either side are the beautiful Chelten Hills.

Riverton, N. J. *W. Tricker.*

The Forest.

The Burma Teak Forests.—II.

FIRST EXPLORATION OF THE FORESTS.

EARLY in February I set out on my first tour into the forests, from which I did not return until late in May, at the commencement of the rains. The province of Pegu, as then constituted, comprised the valleys of two rivers running parallel from north to south. I went up the Sitang valley as far as the town of Toungoo, and after crossing the hills which separate these valleys, returned by the larger of the two valleys, that of the Iraauddi River. The Teak-producing forests are on the hills on either side of these rivers, and I explored these hills, as far as time permitted, in different directions. I have said that the Teak-tree forms a small proportion of the forest. Its companions are Bamboos and a large variety of other trees, at that time none of them possessing any market value. That was forty years ago when the country was thinly inhabited. Now, with a population of three millions, with a number of large and wealthy towns, several kinds besides Teak are used for building and other purposes, and the trade in Bamboos has become considerable. But so large is the forest area that the open country in both valleys is readily supplied from the outskirts. From the remoter forest tracts it does not yet pay to bring away anything but Teak. The other kinds, with few exceptions, are without value now as they were forty years ago. With admiration I beheld the magnificent stems of Terminalia, Anogeinus, Lagerstrœmia and other trees, with clean cylindrical boles branchless to a great height; most of these trees with beautiful dark-colored heart-wood. These trunks would yield huge beams and magnificent planking, and I found it difficult to understand that Teak should be the only marketable timber. When I asked my Burmese companions to explain, they laughed and pointed to a large Terminalia which the storm had blown down. A magnificent piece of timber nearly 100 feet long, the heart-wood dark purple, beautifully mottled, as if made to furnish the most elegant furniture. "Next year, should the master come here, he will find this tree a long heap of brown mold, unless, indeed, the jungle fires should have destroyed it." And this saying of theirs was afterward invariably confirmed by my own experience. It is chiefly the durability of Teak timber in a tropical climate which gives it the high market value it possesses. Teak has other valuable qualities besides durability. Among timbers it holds the place which the diamond maintains among precious stones and gold among metals. There are a few other trees in Burma with heart-wood as durable as that of Teak, but the wood of these kinds is so hard and heavy that they can only be worked with difficulty, and the timber cannot be floated. Teak is easily worked, does not warp or split, takes a beautiful polish, and, if properly treated, floats without difficulty.

EARLY WORKING PLANS.

To establish a regular system in a forest of that description, where Teak was the only marketable tree, obviously was a singularly difficult, nay, at first sight, an impossible task. Each Teak-tree cut would make room for valueless trees of other kinds, while less seed would be shed and consequently fewer Teak seedlings would spring up. Under these circumstances one plan only was feasible—to cut sparingly, to select the trees to be cut with the greatest care, and simultaneously to increase the proportion of Teak in the forest by planting. These essential points I kept in view from the very beginning, though, as regards planting, it was not possible to take action upon a sufficiently large scale, until several years later.

Cuttings, however, had to be made in order to produce money. I knew perfectly well that unless the forests could be made a source of annual net revenue to the Government, regular forest management was not likely to be maintained. These cuttings, however, I was determined should be regulated by a well-considered plan, the object of which would be the maintenance and not the exhaustion of the forests. In order to prepare such a plan it was necessary to know the rate of growth of the Teak-tree, the quantity of growing timber in the forests, and the proportion of the different age classes in each district. In 1856 very little was known regarding the rate of growth of Teak. The timber of that tree has well-defined concentric rings, marked like the annual rings of Oak, Ash and other kinds, by a belt of numerous large pores. Subsequent researches have proved that these concentric rings actually represent a year's growth, the dry season being the period of rest corresponding to the winter of temperate climates. In 1856, however, this had not been fully established. Fortunately there were at the Botanic Gardens in Calcutta and in gardens elsewhere Teak-trees the age of which was known. These I measured, and these data, together with what was known regarding the rate of growth of the Teak-tree in Bombay and on the island of Java, enabled me to form a preliminary though very imperfect idea regarding the rate of growth of this tree.

The growing stock of timber and the proportion of the different age classes constituting this growing stock, would ordinarily be determined by the examination of numerous sample areas, carefully selected, so as to represent the different types of forest. This plan, I soon found, was out of the question. The hilly country, where the Teak-producing tracts were chiefly found, was of enormous extent, several thousand square miles, stocked with forests extremely variable in their character. Large areas of forest without Teak intervened between the Teak-producing tracts, and in these the proportion of Teak varied extremely. No topographical survey of the country had been made and no maps existed to guide me in determining the area of the Teak-producing forests. The only guide I had in that respect at that time, and during the greater part of my service in Burma, were rough sketch maps of the forests, based upon route surveys with prismatic compass and chain, which I prepared while exploring the forests with the aid of native assistants whom I had trained for this work. Yet it was necessary, within the short time I had at my disposal before the rains set in, about three months and a half, to collect sufficient data to enable me to frame a preliminary working plan. Hence I set to work and took in hand successively each forest district which lay near the route which I had fixed upon. Each district was traversed in different directions, and on my march I counted all Teak-trees seen within a certain distance on either side of the track pursued. In forming forest districts I was guided by geographical features and the configuration of the ground. The hills which separate the two main rivers are drained by numerous smaller streams, which eventually join either the Sitang or the Iraauddi River. The catchment area of one of these streams was, as a rule, assigned to one forest district. It took me some time to select, among my Burmese followers, a staff of competent men to assist me in these valuation surveys. When I had organized matters and had myself made sufficient progress in the Burmese language to enable me to carry on my exploration work in the forest without an interpreter, for the interpreter I had brought from Rangoon could not stand the hard work in the tropical heat of the Burma forests, I had already examined several districts, so that I had formed a general idea regarding the character of the forests before I commenced my valuation surveys. In the five districts which remained an area aggregating 3,840 acres was surveyed, and on this area were found 2,423 Teak-trees of the first and 2,503 trees of the second class. It should here be mentioned that in Burma the lumbermen had always been in the habit of measuring the trees by girth, and not by diameter, and this practice I adopted without hesitation, though the results are less accurate than those obtained by diameter measurement. The unit of measure among Burmans at that time was not the foot, but the cubit. This also I adopted, and accepted it as equivalent to eighteen inches. The first question which presented itself to me was to select a minimum size, below which no tree should, as a rule, be felled, and this I fixed at four cubits, or six feet, in girth. Hence all trees above that size were termed first-class, while second-class trees were those between three and four cubits, or between four feet six inches and six feet, in girth. The data which I had collected regarding the rate of growth of the Teak-tree led me to the conclusion that the mean age of trees in girth three cubits, or four feet six inches, was thirty-nine years, and that of trees four cubits, or six feet, in girth was sixty-two years. Hence the conclusion seemed justified that the smallest trees of the second class would attain first-class size within a period of twenty-three years. Later researches have shown that these results were too favorable, and that in the present condition of

the forests the growth is much less rapid than what was assumed in 1856.

Bonn, Germany. *Dietrich Brandis.*

Notes.

According to the *Pacific Rural Press*, another car-load of redwood has just been shipped from California to Nuremburg, Germany, for making lead-pencils, which is another indication that the Cedar forests of Europe, which formerly supplied wood for this purpose, are nearly exhausted.

The beauty and fragrance of the Sweet Peas make them such general favorites that the Everlasting or Perennial species, Lathyrus latifolius, is too often overlooked. The white variety is especially desirable at this season. The flowers are borne on long-stemmed racemes, and, although they have no odor, they are unsurpassed in the purity of their color.

Evaporated apples of the crop of 1896 are already in market, and stock left over from last year is less in demand as the season advances. Dried huckleberries of this season are offered at eight cents a pound by the wholesale dealers, raspberries at fifteen cents, and new southern dried cherries at ten cents a pound in large quantities. Royal apricots, from California, are also here, and cost nine cents a pound.

Potatoes have been coming into the wholesale markets of this city in more than adequate supply and prices have suffered correspondingly, so that seventy-five cents a barrel was an average price last week. Sweet potatoes also are being handled without profit to the grower. Prices declined steadily last week from $1.75 and $2.00 a barrel on Monday until on Friday, when the highest-grade yellow sweet potatoes, from New Jersey, in large barrels, brought as little as $1.00, and red sweet potatoes, from North Carolina, commanded but fifty to sixty-five cents a barrel.

Plants which have spines and other contrivances for protecting themselves are often used by defenceless plants as shelters. Professor Kerner notes that certain wild Vetches and umbelliferous plants, which would furnish good fodder for grazing animals, are regularly found in the prickly hedges along the roads and under spiny bushes, which form a belt around forests. These bushes not only defend their own foliage, but also the delicate plants which have been established under their protection. This is no partnership or symbiosis, however, for the advantage is all on the side of the plants protected. The armed bushes receive no profit or return from the plants they defend, and they do not protect them intentionally.

A correspondent writing of Mrs. Shepherd's garden at Buenaventura, California, says that she grows two crops of seed from Cosmos every year on the same ground. Seeds of the new strain when sown early follow the customs of California annuals and become more dwarf, while they seem to hurry into bloom earlier every year. New shades of color are said to be coming into the flowers and modifications of habit in various ways, so that a field of the new early Cosmos in full bloom is a beautiful sight. No doubt, this is all true, but so far the new strains as grown here cannot compare with the older kinds in grace of form, although they may equal them in richness of color. A first-rate strain of early-flowering Cosmos would be a boon to eastern gardens, for the plants here are always cut down by frost while at the height of their bloom.

Mr. Joseph Meehan, in a late number of *The Country Gentleman*, gives an account of his way of planting conifers in August. The hole to receive the tree having been dug beforehand, the tree is lifted and placed in its new position and soil is filled in until the ball is about covered. Water is then given in abundance, and it may be stirred about with a stick until it is of the consistency of mush and will settle closely about the roots. No tramping is required, but after soil and water have settled, say in four or five hours, the remaining soil needed is filled in and a mulch is put about the roots. Of course, all conifers do not transplant well at this season, most of the Pines which have not many fibrous roots being exceptions. The reason why this is a safe season for planting is that the soil is warm like that in a propagating-bench, and when the roots are kept moist the tree will throw out new roots like a cutting. If the trees are more than six feet high the tops should be sprinkled with water for a few nights to check too rapid transpiration, until they have become thoroughly established.

Professor F. A. Waugh has lately prepared for the Vermont Experiment Station a bulletin on the pollination of Plums, a matter which has been the subject of much investigation during recent years. It is well known that Plums are uncertain about setting fruit, and a part of this uncertainty seems due to the fact that the blossoms do not fertilize themselves. Professor Waugh explains how cross-pollination is provided for by the defectiveness of the flower parts and by other natural adaptations. There is a general agreement among horticulturists and botanists that cross-fertilization is desirable, and it seems that since the American varieties of cultivated Plums have been derived from several distinct species they can best be made fruitful by crossing with varieties that are closely related to each other botanically. The bulletin is instructively illustrated, and in addition to Professor Waugh's own observations it contains the quoted opinions of many eminent horticulturists. We have acquired considerable knowledge as to the pollination of Plums, but there are many questions of practical bearing and theoretical interest that invite investigation. The hope is expressed that this bulletin will direct attention to some of these unanswered questions and encourage others to make observations in this line. The bulletin closes by suggesting several subjects for inquiry, and many more will occur to the investigator who takes hold of the subject in earnest.

The importations of lemons during July in this city amounted to 222,975 boxes, 235,600 boxes having been received last year in the same month, and 358,350 during the same term in 1894. Prices have advanced rapidly with the hot weather. Last Friday the cargo of the steamship Karamania realized $1.12½ to $4.75 a box for Palermo lemons, while the Sorrento fruit brought $3.25 to $5.62½, and Majori lemons commanded $3.50 to $6.12½. At the same sale Rodi and Sorrento oranges brought $2.62½ to $5.12½ a box. During July 387,680 bunches of bananas came into this port, against 535,475 bunches received in the same month in 1895. The supply of cocoanuts has been very large, 827,800 bags having been received here last month, while but 194,000 bags constituted the supply in July, 1895. Seventy-five car-loads of California fruits were sold here during last week. Owing to the large quantity received and the intensely hot weather prices declined steadily, and Bartlett pears sold for $1.10 to $1.50 a box. At these prices nothing whatever is returned to the grower, since the cost for freight alone is something more than $1.00 a box, besides expenses for commissions, boxes, paper, nails, packing, etc. California peaches are of good size and color, and some of the best ever seen in eastern markets, as the Decker, are now coming from that state. Owing to the heavy receipts of this fruit from Delaware and other near-by states, prices have been low, and Crawfords from the Pacific coast sold last week for fifty-five to eighty cents, exceptionally fine lots bringing $1.00 a box. Plums and prunes are offered in large variety and moderate quantity, prices ranging from $1.10 to $1.50 a box at wholesale.

Last year the English papers made protest against the robbing of country lanes and woods of Ferns, to be sold in the cities, and just now they are raising what seems to be a justifiable cry of alarm against the spoliation of all kinds of greenery which beautify the country landscape. *The Gardeners' Magazine*, for instance, declares that the heaths and open places about London are rapidly being stripped of everything green except grass and such well-armed plants as Brambles which can protect themselves against the dwellers of the town, who, on their incursions into the country, tear to pieces and carry away everything green unless it is defended by thorns. Of course, it is natural that the residents of towns should admire things green, and the desire may be natural to deck their homes with souvenirs of their rural outings. But as the excursionists increase in number with improved facilities for travel, the indulgence of this desire means the annihilation of the vegetation concerned. These people should be taught to confine their admiration to the plants and flowers when growing in beauty in their native habitats, instead of carrying their draggled fragments home until they are quite exterminated. Any one who has noticed the trolley cars and excursion trains on their return to this city must have observed how large a proportion of these excursionists carry armfuls of wilted Ferns, branches of shrubs and herbaceous plants. Of course, these fragments of vegetation will have no beauty by the time they reach their destination. Their native haunts are left desolate for the time, and since no vegetation can endure such plucking year after year many of the beautiful plants within picnic distance of the city will be practically exterminated, unless some measures are taken to protect them.